

REMARKS

This paper responds to the Office Action mailed on October 20, 2006.

Claims 63-88 are amended (now renumbered as 63-87, as number 69 was skipped), no claims are canceled, claims 62-87 stand withdrawn, and claim 88 is added; as a result, claims 19-24, and 51-88 are now pending in this application.

Claims 63-87 are amended to correct a claim numbering problem and are not amended in response to any pending rejection. These amendments merely correct typographical errors.

Election

At Office Action page 2, claims 62-88 are withdrawn based on election by original presentation. Applicant respectfully traverses. The Office Action provides no basis for such an election. The Office Action states the standard but provides no reasons for the withdrawal. Specifically, the Office Action states “Newly submitted claims 62-88 are directed to an invention that is independent or distinct from the invention originally claimed (claims 19-24 and 51-61)” and cites MPEP § 821.03. However, MPEP § 821.03 sets forth the standard paragraph for use in this instance, which requires a reason, as follows: “Newly submitted claim [1] directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: [2].” The analysis required for independent and distinct is not present. Accordingly, applicant submits that a *prima facie* case of election by original presentation has not been made. Consideration of all pending claims is requested.

First §103 Rejection of the Claims

Claims 19, 21-24, 51-54, 56-58 and 60-61 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie (U.S. 5,898,858) in view of Capote et al. (U.S. 6,121,689) and Gilleo (U.S. 6,265,776). Applicant respectfully traverses the rejection of these claims for the reasons stated below.

Applicant reserves the right to swear behind Gillespie, Gapote et al, or Gilleo at a later date.

To retain a rejection to a claim under §103(a), the prior art reference (or references when combined) must teach or suggest all the claim limitations, and there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

Regarding claim 19:

Applicant submits that, even combined, Gillespie, Capote et al. and Gilleo fail to teach or suggest all of the claimed subject matter included in claim 19. Claim 19 includes elements not taught or suggested by the proposed combination of Gillespie, Capote et al. and Gilleo. Claim 19 recites (with emphasis added):

.....

an adhesive layer covering the first side of the first semiconductor device with a first surface of the adhesive layer contacting the first side, the adhesive layer having an array of column-shaped openings substantially aligned with one or more connection pads of the first array of connection pads and having a chamfer, opposite the first surface of the adhesive layer, at each of the column-shaped openings; and

a conductive material filling the array of column-shaped openings.

Thus, claim 19 includes **an adhesive layer covering the chip and having an array of column-shaped openings with a chamfer**, and claim 19 further includes **a conductive material filling the array of column-shaped openings**.

The Office Action on page 2 admits, “Gillespie does not explicitly disclose the chip package includes an adhesive layer covering the chip and having an array of openings aligned with connection pads having a chamfer opposite the first surface of the adhesive layer at each of the openings and a conductive material substantially filling the array of openings.”

In Capote et al, Applicant cannot find a teaching or suggestion of an array of column-shaped openings **having a chamfer** as recited in claim 19. Furthermore, since Capote et al fail to teach or suggest an array of column-shaped openings having a chamfer, Capote et al fail to teach or suggest “**a conductive material filling the array of column-shaped openings**” (openings having a chamfer) as recited in claim 19.

Gilleo fails to cure the deficiencies of Gillespie and Capote et al. In contrast to the limitations recited in claim 19 of the present application, Gilleo, on column 7, line 52 - column 8, line 3, recites,

After the solder bumps 14 have been provided with a flux coating 16, **the spaces on the wafer surface between the solder bumps 14 are provided with an underfill** in the liquid phase. The liquid underfill is applied to the wafer by spin coating, screen printing, or any of the common methods for applying liquids to surfaces. The resulting device is depicted in FIG. 4. Specifically, **FIG. 4 shows a wafer 12 having solder bumps 14 each having a flux coating 16. The underfill material 18 is deposited on the wafer 12 in the spaces between the solder bumps 14.** Since the flux coating 16 has a low surface energy, the underfill 18 does not become a coating over the flux 16. This is because surface chemistry principles require that wetting will only occur if the surface energy of the liquid (i.e., the underfill 18) is lower than that of the solid surface (i.e., the flux coating 16). Since the materials are selected such that the flux liquid has a higher surface energy than the flux coating, **a receding contact angle results at the interface between the flux coating 16, the underfill 18, and the surrounding air.**

Applicant submits that Gilleo has no **openings** and no conductive material filling the openings as recited in claim 19. Gilleo discloses underfill material is deposited on the wafer in the spaces between the solder bumps, and Gilleo states that the underfill merely fills the spaces between solder bumps. Thus, it can be seen that Gilleo teaches that, prior to applying the underfill material, the solder bumps have already been provided on the wafer, hence Gilleo has no **openings** in the flip chip as recited in claim 19.

Because Gilleo does not teach **openings** as recited in claim 19, and the underfill of Gilleo merely fills the spaces between solder bumps, thus is not equivalent to the adhesive layer, which covers the chip and have an array of column-shaped openings with a chamfer, as claimed in claim 19. Thus, Applicant submits that Gilleo does not teach **an adhesive layer** as recited in claim 19.

Because Gilleo does not teach **openings** as recited in claim 19, of course, Gilleo does not teach "a conductive material filing the array of column-shaped openings" as recited in claim 19. Additionally, in contrast to claim 19, Gilleo discloses "solder bumps 14 each having a flux

coating 16". Referring to Fig. 4 and Fig. 5, Gilleo discloses that each solder bump 14 is separated from the underfill material 18 by the a flux coating 16, thus, in fact, any so called "openings" (asserted by the Office Action, but expressly denied by Applicant) includes not only a solder bump but also a flux coating. Accordingly, Gilleo fails to teach or suggest "**a conductive material filling the array of column-shaped openings**" as recited in claim 19.

Therefore, Applicant submits that, even combined, Gillespie, Capote et al., and Gilleo does not teach or suggest all of the limitations of claim 19, thus claim 19 is not obvious, and is patentable over the proposed combination of Gillespie, Capote et al., and Gilleo.

Additionally, as stated in the response to the Final Office Action, Applicant submits that the Office Action fails to state a *prima facie* case of obviousness with respect to claim 19 because the Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo.

The Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). To do that the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would lead an individual to combine the relevant teaching of the references. *Id.*

The *Fine* court stated that:

Obviousness is tested by "what the combined teaching of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).

Further, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); MPEP § 2143. The Examiner must avoid hindsight. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990).

In an attempt to meet these requirements, on pages 3 and 4, the Office Action states,

Therefore, it would have been obvious to one having ordinary [sic] in the art at the time the invention was made to modify the device structure of Gillespie by having an adhesive layer covering the chip and having an array of opening aligned with connection pads having a chamfer and a conductive material substantially filling the array of openings, as taught by Capote et al. and Gilleo, in order to provide a flip chip configuration without bending the chip and substrate and form the contact angles at the interface between the flux coating and the underfill layer.

Applicant respectfully disagrees with these statements, and further submits that the Office Action fails to point to any disclosure or any portion of the cited documents to support these statements. For example, Applicant cannot find, in any one of Gillespie, Capote et al. and Gilleo, a teaching or suggestion that **the flip chip includes an adhesive layer having an array of openings with a chamfer** as claimed in claim 19 of the present application, thus, of course, no suggestion to combine them can be found or expected in these documents cited in the Office Action. Without such support, the Office Action fails to meet the requirements as quoted above for forming the proposed combination of Gillespie, Capote et al. and Gilleo, and thus is attempting to combine the teachings of Gillespie, Capote et al. and Gilleo based on Applicant's disclosure using impermissible hindsight.

While the Office Action recites that the proposed combination of Gillespie, Capote et al. and Gilleo would form the contact angles at the interface between the flux coating and the underfill layer (Office Action, page 4, lines 1-2), there is no motivation, suggestion or teaching why one of skill in the art would desire such contact angles apart from the applicant's own disclosure. Accordingly, an adequate motivation to combine these Gillespie, Capote et al. and Gilleo has not been provided.

By failing to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo, the Office Action fails to state a *prima facie* case of obviousness with respect to claim 19.

Applicant further submits that there is no reasonable expectation of success in combining Gilleo with Gillespie and Capote. Gilleo forms solder bumps then underfills to form contact angles with the underfill. In contrast, Capote states that its "gap 18 is completely filled with an

encapsulant material 22" (col. 8, lines 4-5). Accordingly, Capote teaches there is no chamfer as recited in claim 19 and adding one would destroy its intended purpose as expressly stated in Capote.

For at least the reasons stated above, the 35 U.S.C. § 103(a) rejection of claim 19 cannot stand. Applicant respectfully requests withdrawal of the rejection of claim 19, and reconsideration and allowance of claim 19.

Regarding claims 21-24, 51-54, 56-58 and 60-61:

Claims 21-24, 51-54, 56-58 and 60-61 directly depend from independent claim 19. For at least the reasons stated above with respect to the independent claim 19, Applicant submits that these dependent claims of the present application are patentable over the proposed combination of Gillespie, Capote et al, and Gilleo.

Applicant respectfully requests withdrawal of the rejection of claims 21-24, 51-54, 56-58 and 60-61, and reconsideration and allowance of these claims.

Second §103 Rejection of the Claims

Claims 20, 55 and 59 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie in view of Capote et al. and Gilleo as applied to claim 19 above, and further in view of Toyosawa et al. (U.S. 6,337,257). Applicant respectfully traverses the rejection of these claims for the reasons stated below.

Applicant reserves the right to swear behind Toyosawa et al at a later date.

As stated above, Applicant submits that the proposed combination of Gillespie, Capote et al. and Gilleo fails to teach or suggest all of the claimed limitations as recited in independent claim 19. Additionally, the Office Action fails to point out, and Applicant cannot find, in Toyosawa et al., a teaching or suggestion of the limitations recited in claim 19 but missing in the proposed combination of Gillespie, Capote et al, and Gilleo. Thus, the proposed combination of Gillespie, Capote et al, Gilleo and Toyosawa et al also fails to teach or suggest all of the limitations recited in claim 19.

Claims 20, 55, and 59, directly or indirectly, depend from independent claim 19, therefore include all of the limitations recited in claim 19. Thus, the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al. fails to teach or suggest all of the limitations

recited in claims 20, 55, and 59. Because the proposed combination of Gillespie, Capote et al., Gilleo and Toyosawa et al. fails to teach or suggest all of the subject matter included in claims 20, 55, and 59, they are not obvious, and are patentable over the proposed combination of Gillespie, Capote et al, Gilleo, and Toyosawa et al.

Additionally, the Office Action fails to state a *prima facie* case of obviousness with respect to claims 20, 55, and 59 because the Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al, Gilleo, and Toyosawa et al.

Applicant submits that the Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al, Gilleo, and Toyosawa et al. For example, Applicant cannot find, in any one of Gillespie, Capote et al, Gilleo, and Toyosawa et al a teaching or suggestion that **the flip chip includes an adhesive layer having an array of openings with a chamfer** as claimed in claims 20, 55, and 59 of the present application, thus, of course, no suggestion to combine them can be found or expected in these documents cited in the Office Action. In rejecting claims 20, 55, and 59, the Office Action provides no addition support for forming this proposed combination of Gillespie, Capote et al, Gilleo, and Toyosawa et al. Thus, the Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al, Gilleo and Toyosawa et al.

By failing the meet the requirements for forming the proposed combination of Gillespie, Capote et al, Gilleo, and Toyosawa et al, the Office Action fails to state a *prima facie* case of obviousness with respect to claims 20, 55, and 59.

For at least the reasons stated above, the 35 U.S.C. § 103(a) rejection of claims 20, 55, and 59 cannot stand. Applicant respectfully requests withdrawal of the rejection of claims 20, 55, and 59, and reconsideration and allowance of these claims.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at 612-349-9547 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date

17 Jan '07

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 17 day of January 2007.

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